

## CIRCULAR No. 87

# ALFALFA.

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This wonderful forage plant was introduced to this State some time between the years 1851 and 1854, and has not only become, in the time that has elapsed since its introduction, the standard forage plant of California, but it has also become known and appreciated far beyond the boundaries of the State. The annual value of the crop in California approximates some thirty-five millions of dollars now and the acreage devoted to its culture is constantly being increased. In view of these facts and recognizing the fact that concise information in the matter is demanded by both old and new planters the following summary of practice is presented.

### SOIL REQUIREMENTS.

Alfalfa is a deep feeding plant, sending its long tap root far down into the soil for nutriment. This deep feeding character of the plant should be noted and so far as possible the fact should be taken into consideration by the intending planter. A deep, well-drained, moderately heavy loam with no hardpan strata between the surface soil and the water bearing strata is to be preferred. Our best alfalfa fields are on such soils as these where surface water is to be found at from twelve to twenty feet down. This optimum of soil conditions should be sought by the intending planter; yet because of the adaptability of the plant, he may allow himself considerable latitude in the choice. Satisfactory alfalfa plantations are to be found on our very light sandy loams and on our very heavy adobe lands.

Noting the deep rooting habit of this plant, those soils where free water is found close to the surface should be avoided. Under these conditions the tap root is likely to decay and the plant will suffer if it does not succumb. Good drainage of the soil is an essential for success with this crop.

Most of our California soils are well supplied with the mineral plant food necessary for success with alfalfa, but, in many of these soils, there is a deficiency of decomposing organic matter, of humus. In this latter case it may be necessary to supply the lack by growing a winter green manure crop on the land and plowing it in, in the spring, before seeding to alfalfa. The character of the green manure crop will vary with the local climatic conditions though "the most favorable immediate results can probably be secured by the use of rye. This should be seeded at the rate of 80 pounds per acre." (U. of C. Exp. Sta. Bull. 211, p. 271.)

### CLIMATIC REQUIREMENTS.

The first recorded seed of alfalfa brought into California came no doubt from Chili. Planted, as it was, in the great inland valleys of the State, its production here was begun under climatic conditions very similar to those from whence came these first seed importations. Soon, however, its adaptability to conditions very different to those found in the great valleys was proved and it is now a staple crop from the most northern counties of the State to the most southern. Alfalfa, however, seems to do best away from the immediate influence of the coast climatic conditions. For its best growth and production a long, hot growing season is desirable and the longer this growing season is, if other conditions are favorable, the greater will be the number of crops cut each year and the greater will be the yield. This optimum of climatic conditions then should be sought by the intending planter. However, wonderfully satisfactory plantations of alfalfa are to be found in regions of this State where the growing season is short. So we are justified in saying that the adaptability of the plant allows of its use under a great variety of climatic conditions.

### WATER REQUIREMENTS.

Under our California conditions of climate and soil the intending planter of alfalfa should be able to command irrigation water for his fields, either by gravity ditch or through wells and pumping systems. In general, this command of water may be considered as an essential for success. It is true that many alfalfa fields are to be found in this State where no facilities for irrigation exist and yet good crops are harvested for terms of years; still the success of these occasional fields is not so great as it would be were water available when needed. Both pocket gophers and squirrels are a pest in alfalfa fields and the only fully effective way to destroy them is by drowning. If the general soil conditions do not seem to demand the use of irrigation water for the success of the crop yet the possibility of drowning out these pests must be considered.

As to the amount of water, the intending planter should be prepared to use for irrigation purposes, the figures will vary with the character of the soil and with the depth of soil to the water table. In the Sacramento Valley with a rainfall of from 18 to 20 inches a year, from 3 to 18-acre inches of irrigation water are used. This great variation at least emphasizes the fact that the amount of irrigation water will depend on the individual need of different fields at different times and no set rule as to amount to be used can be enunciated. The needs of the field must be determined by the irrigator.

### PREPARATION OF THE LAND.

Much of the land that is being put into alfalfa in this State has been used previously either for pasture purposes or for grain growing. In either case, but more especially in the latter, the physical condition of the soil is bad. Almost invariably we find in these lands at a depth of a few inches what is commonly known as a "plow sole" or "cultivation hard pan." This is in no wise to be considered as a true hardpan, but is, more correctly speaking, a concentration at the ordinary cultivation depth of the finer particles from the upper strata of the soil. This "plow sole" must be broken up to obtain satisfactory results from the land in growing alfalfa. The first move then, in the proper preparation of land for alfalfa, is to plow it deeply so as to fully break up the "plow sole." This deep plowing should be done *before* any leveling is done. In many cases that we have studied the plowing has been done *after* leveling, and, as a consequence, in the low places, filled in with moved earth, the plow sole has not been broken up. The result has been that in a short time—a year or two—the field presented a spotted appearance and the alfalfa failed to produce as it should in the places where breaking had not been done.

The land should be well leveled so that it can be irrigated in the most economical way. To do this the services of a surveyor should be called in and levels determined. If the square check system of irrigation is to be used, the checks should be of such a size as will permit of the high point being covered with water to a depth of three inches at least with a levee system of not more than twelve inches in height at its highest point. The levees should be made both broad and low, not more than twelve inches high at the most, as before stated, so that when the field is producing, the various implements, mowing machines, rakes, wagons, and so on may be used over the field as a whole without reference to the levees. The slope of the land may be such that contour line levees may have to be used. If this is the case, the same general principle of low levees holds. In certain cases it may be desirable to use the strip system of levee placing. This system can be used to advantage where the soil is moderately heavy and where the land slope is not too abrupt.

While deep plowing is essential in the proper preparation of land for alfalfa planting, it should be remembered that the alfalfa seed demands a firm, compact seed bed for its best success. Therefore, after the land has been deeply plowed, leveled and scraped and then replowed, it should be gone over carefully with some sort of compacter. An ordinary roller followed by a light harrow may be used. The disk cultivator with the bar set straight has been successfully used for compacting. Indeed, any implement that will compact the soil somewhat and still leave the surface fairly loose may be used.

### SEEDING.

The first question that will arise in the mind of the intending planter, when it comes to a choice of seed, probably will be as to the variety of alfalfa to plant. Studies of this question indicate that for the general conditions found in California, the Chilian alfalfa, the first to be introduced to the State, is the most satisfactory. For the ordinary plantings then, in our great valleys, either north or south, good, clean, vigorous seed of this variety, should be used. The source of this seed, that is, the locality where grown, should be known by the planter so that its desirability may be in part at least predicated. Four ounce samples of the seed may be sent to the Experiment Station, Berkeley, California, for purity and germination test. This service is performed gratis and the intending planter should certainly take advantage of it so that he may be sure he is using strong seed free from dodder and other noxious weed seeds.

If the conditions of moisture, climate and soil are not wholly satisfactory, the intending planter should use the Turkestan variety of alfalfa. This variety will crop on less water than will the Chilian and will make a better growth in cold weather than will this last. The Turkestan alfalfa does not, here in California, make as fine and clean feeding a hay as does the Chilian. A third variety of alfalfa, known as Arabian, is desirable for certain special purposes. It is known as a five year perennial, while those previously here mentioned are known as twenty-five year perennials. The Arabian alfalfa is especially good for heavy soils, makes a good winter growth, and the product is fine in character. It is especially to be recommended for orchard interplanting, as it begins to fail in the fifth or sixth year of its growth and can be easily plowed out of the orchard when the trees are making strong demands on the soil. Many other varieties of alfalfa have been tested in California, but so far the choice seems to lie between the three varieties named.

The amount of seed used per acre varies very materially with different planters, but careful studies of the question indicate that if a clean, vigorous seed is used, from twelve and a half ( $12\frac{1}{2}$ ) to fifteen (15) pounds per acre is ample. Using more of such seed would mean waste. This seed should, for best results, be drilled into the well prepared land and no *nurse crop* used. Some planters use a nurse crop of some cereal, but the practice does more harm to the young alfalfa plants in robbing them of moisture than it does good in a fancied protection.

The time of planting will depend altogether upon the frost conditions in the locality where the planting is to be made. The fact should be noted that the alfalfa plant, when in the seed leaf stage, is easily killed by frost. If, then, frosts are likely to occur in the region where the plantings are being made in the fall, seeding should be postponed until all danger of cold is over in the spring. After the plant has passed the seed leaf stage it is much more resistant to frost.



### INOCULATION.

It is a well recognized fact that for full success in growing alfalfa the plants must be supplied with nitrogen gathering bacteria. These minute organisms, so essential to the proper growth of this plant, are usually present in our California soils, but as a general thing artificial inoculation should be practiced. Where new plantings are to be made, especially if at a distance from other plantings, it is the part of wisdom to insure the presence of bacteria by some inoculating process. There are to be obtained on the market pure cultures of bacteria for the purpose in question, and under some conditions it may be desirable to use these cultures. Generally, however, a perfect inoculation can be obtained by broadcasting one or two hundred pounds of soil from some well growing alfalfa field over each acre of the new field. This inoculating soil should be well harrowed into the land before seeding is done. The process is not difficult and requires no technical skill.

Inoculation can also be most satisfactorily accomplished by what is known as the "soil suspension" method. A quantity of soil is taken from some alfalfa field that is growing well and upon the roots of the plants of which the nodules, indicating the presence of the desired bacteria, can be found. To the volume of soil used two or three times its volume of water is added. This is stirred vigorously several times a day for two days, and then the earth is allowed to settle. The alfalfa seed is then dipped in the water which now carries the bacteria. The seed then is dried in the shade enough so that it separates readily. Planting should then follow immediately. The method has the advantage of being cheap, easy and effective. The planter of alfalfa should certainly insure the presence of these necessary bacteria.

### IRRIGATION AND TIME OF CUTTING.

It has been previously pointed out that no definite rule as to the amount of water to be used in growing alfalfa can be laid down. In general, however, experience indicates that frequent shallow irrigations are to be preferred to occasional heavy floodings. In the writer's experience and observation an irrigation of about three acre inches ten days before cutting the alfalfa brings the best result on most soils.

Irrigating at this time before cutting has a tendency to overcome leaf shedding, and it should be remembered that the best part of the food value of alfalfa is in the leafage. Alfalfa should not be allowed to become too mature before cutting as when this occurs there is sure to be considerable leaf dropping and food loss. There are two good rules to follow in determining time to cut. The first of these rules is to cut when an occasional blossom is to be seen in the field. This

is a fairly good rule, but the second, to cut when new growth appears at the crown of the plant, is perhaps more reliable.

Finally, the alfalfa planter should remember that he is dealing with a growth of high food value, capable of being used as a ration for all farm animals, and a plant that will continue to produce well through a generation, and perhaps longer, and he should, therefore, spare no pains in getting the best results from his plantings. Proper care at all points will accomplish this.